Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently amended) An in vitro method of transdifferentiating an epidermal basal cell having one or more morphological, physiological and/or immunological feature(s) of a neuronal cell, comprising:

(a) culturing a proliferating epidermal basal cell population comprising one or more epidermal basal cell(s), said cell(s) derived from the skin of a mammalian subject;

(b) exposing the cell(s) to an amount of ~~an~~ fetuin, noggin, chordin, gremlin or follistatin antagonist of bone morphogenetic protein (BMP) effective to antagonize endogenous BMP signal transduction activity;

(c) growing the cell(s) in the presence of at least one antisense oligonucleotide comprising a segment of a human MSX1 gene and/or a segment of a human HES1 gene~~, or homologous non-human counterpart of either of these,~~ in an amount effective to suppress the expression of functional gene product of MSX1 or HES1, whereby the cell is transdifferentiated into a cell having one or more morphological, physiological and/or immunological feature(s) of a neuronal cell; and

(d) growing the transdifferentiated cell in a medium comprising a retinoid compound and a signal molecule selected from the group consisting of brain-derived neurotrophic factor (BDNF), platelet-derived growth factor (PDGF), nerve growth factor (NGF), sonic hedgehog, sonic hedgehog aminoterminal peptide, neurotrophin (NT)-3, and neurotrophin (NT)-4; and

wherein the physiological and/or immunological feature comprises expression of a neuronal cell marker selected from the group consisting of neurofilament M, neural-specific ß-tubulin, neural-specific enolase, and microtubule associated protein 2, or a combination of any of these; and wherein

the morphological feature comprises one or more morphological neurite-like process(es) at least about 50 micrometers in length.

2. (Previously presented) The method of Claim 1, wherein the subject is a human.

3. (Previously presented) The method of Claim 1, wherein the epidermal basal cell(s) is derived from a skin biopsy.

4. (Previously presented) The method of Claim 1, wherein culturing the proliferating epidermal basal cell population further comprises separating keratinized epidermal cells from the epidermal basal cells in a calcium-free medium.

5. (Previously presented) The method of Claim 1, wherein the amount of the antagonist of bone morphogenetic protein is about 10^{-6} to 10^{-4} M.

6. (Previously presented) The method of Claim 5, wherein the amount of the antagonist of bone morphogenetic protein is about 5×10^{-6} to 5×10^{-5} M.

7. (Previously presented) The method of Claim 1, wherein the antagonist of bone morphogenetic protein (BMP) is fetuin, noggin, chordin, gremlin, or follistatin.

8. (Previously presented) The method of Claim 7, wherein the fetuin is mammalian or avian fetuin.

9. (Previously presented) The method of Claim 8, wherein the mammalian fetuin is human, bovine, porcine, ovine, or equine fetuin.

10. (Previously presented) The method of Claim 1, wherein the antisense oligonucleotide(s) is modified with one or more thio groups.

11. (Previously presented) The method of Claim 1, wherein the amount of the antisense oligonucleotide is about 5×10^{-6} M to about 10^{-5} M.

12-14. (Canceled)

15. (Previously presented) The method of Claim 1, wherein the retinoid compound is all-trans retinoic acid or Vitamin A.

16-42. (Canceled)

43. (Currently amended) A kit for transdifferentiating, in vitro, an epidermal basal cell into a cell having one or more morphological, physiological and/or immunological feature(s) of a neuronal cell, comprising:

(A) ~~an~~ a fetuin, noggin, chordin, gremlin or follistatin antagonist of bone morphogenetic protein (BMP); and

(B) at least one antisense oligonucleotide comprising a segment of a human MSX1 gene, and/or a segment of a human HES1 gene~~, or a non-human homologous counterpart of either of these~~; and

(C) a retinoid compound and a signal molecule selected from the group consisting of brain-derived neurotrophic factor (BDNF), platelet-derived growth factor (PDGF), nerve growth factor (NGF), neurotrophin (NT)-3, neurotrophin (NT)-4, sonic hedgehog, and sonic hedgehog aminoterminal peptide.

44. (Previously presented) The kit of Claim 43, further comprising instructions for using (A) and (B) in transdifferentiating a subject's epidermal basal cell(s).

45. (Previously presented) The kit of Claim 43, wherein the antagonist of bone morphogenetic protein (BMP) is fetuin, noggin, chordin, gremlin, or follistatin.

46. (Canceled)

47. (Previously presented) The kit of Claim 46, wherein the retinoid compound is all-trans retinoic acid or Vitamin A.

48. (Canceled)

49. (Currently amended) An in vitro method of transdifferentiating an epidermal basal cell into a cell having one or more morphological, physiological and/or immunological feature(s) of a neuronal cell, comprising:

(a) culturing a proliferating epidermal basal cell population comprising one or more epidermal basal cell(s), said cell(s) derived from the skin of a mammalian subject;

(b) exposing the cell(s) to an amount of ~~an~~ a fetuin, noggin, chordin, gremlin or follistatin antagonist of bone morphogenetic protein (BMP) effective to antagonize endogenous BMP signal transduction activity;

(c) growing the cell(s) in the presence of at least one antisense oligonucleotide comprising a segment of a human MSX1 gene and/or a segment of a human HES1 gene~~, or homologous non-human counterpart of either of these,~~ in an amount effective to suppress the expression of functional gene product of MSX1 and/or HES1, whereby the cell is transdifferentiated into a cell having one or more morphological, physiological and/or immunological feature(s) of a neuronal cell; and

(d) growing the transdifferentiated cell in a medium comprising a retinoid compound and a signal molecule selected from the group consisting of brain-derived neurotrophic factor (BDNF), platelet-derived growth factor (PDGF), nerve growth factor (NGF), neurotrophin (NT)-3, neurotrophin (NT)-4;

wherein the physiological and/or immunological feature comprises expression of a neuronal cell marker selected from the group consisting of neurofilament M, neuro-specific ß-tubulin, neural-specific enolase, and microtubule associate protein 2, or a combination of any of these; and

wherein the morphological feature comprises one or more morphological neurite-like process(es) at least about 50 micrometers in length.

50. (Previously presented) The method of Claim 49, wherein the subject is a human.

51. (Previously presented) The method of Claim 49, wherein the epidermal basal cell(s) is derived from a skin biopsy.

52. (Previously presented) The method of Claim 49, wherein culturing the proliferating epidermal basal cell population further comprises separating keratinized epidermal cells from the epidermal basal celled in a calcium-free medium.

53. (Previously presented) The method of Claim 49, wherein the amount of the antagonist of bone morphogenetic protein is about 10^{-6} to 10^{-4} M.

54. (Previously presented) The method of Claim 53, wherein the amount of the antagonist of bone morphogenetic protein is about 5×10^{-6} to 5×10^{-5} M.

55. (Previously presented) The method of Claim 49, wherein the antagonist of bone morphogenetic protein (BMP) is fetuin, noggin, chordin, gremlin, or follistatin.

56. (Previously presented) The method of Claim 55, wherein the fetuin is mammalian or avian fetuin.

57. (Previously presented) The method of Claim 56, wherein the mammalian fetuin is human, bovine, porcine, ovine, or equine fetuin.

58. (Previously presented) The method of Claim 49, wherein the antisense oligonucleotide(s) is modified with one or more thio groups.

59. (Previously presented) The method of Claim 49, wherein the amount of the antisense oligonucleotide is about 5 x 10-^{6} M to about 10^{-5} M.

60. (Previously presented) The method of Claim 49, wherein the retinoid compound is all-trans retinoic acid or Vitamin A.

61-66. (Canceled)